Orbital Riveting Machine

Akshay N. Bhandare[1], Samruddha S. Karande[2], Akash S. Patil[3], Jasmin H. Navalekar[4]
[1, 2, 3,L 4] Dept of Mechanical engineering
[1, 2, 3, 4, 5] SSPM COE, Kankavli

Abstract- *Orbital riveting is a relatively new technology in which parts are produced by specific movement of tools. Special incremental motion enables smaller contact area between tool and work piece and Therefore, lower forming load and friction.Hence, orbital forging in some cases makes it possible to produce a desired part in only one operation, whereas in conventional riveting two or more operations would be required. However, orbital riveting has number of setbacks, such as more complex machine maintenance and production times. This paper presents a brief overview of Design and Development of Orbital Riveting machine main orbital riveting characteristics and comparison with conventional riveting machine. Auto-cad drawing,3D model, Actual diagram for specific machine for orbital riveting is present as well.*

Keywords- Orbital Riveting, Design, Development, Cost.

I. INTRODUCTION

By riveting we mean the upsetting of an rivet to form a head to hold several assembled parts together. The rivet can be in the form of a pin or an eyelet. Orbital Riveting Process is one of the most versatile processes of cold forming of metals. The deforming force has to be so large that the stress in the deforming region reaches the value of YIELD STRESS of that material. At this value of stress the material starts flowing and the riveting head is formed. In conventional method the force is applied by a hammer or by a pneumatic or hydraulic cylinder on a punch. Theoretically the riveting force required is the yield stress of the material multiplied by the area of the rivet shank in contact with the punch.In ORBITAL riveting process the riveting tool (or punch) is inclined with respect to the rivet axis. This reduces the area of contact between the punch and the rivet shank. Thus the riveting force required is reduced drastically. The inclined riveting tool also rotates around the axis of the rivet. This result in very gentle deformation of the material.Rivet is set at the joint such that the rivet set angle is from 10 to 80 depending upon the joint to be obtained. It turns around the vertical axis at about 2000 to 3000 rpm and describes a cone whose apex corresponds to the center of gravity of the joint formed. It is the tool which gives the shape energy usage.

II. DESIGN THEORY

In our attempt to design aORBITAL RIVETING MACHINE we have adopted a very a very careful approach, the total design work has been divided into two parts mainly;

- System design
- Mechanical design

System design mainly concerns with the various physical constraints and ergonomics, space requirements, arrangement of various components on the main frame of machine no of controls position of these controls ease of maintenance scope of further improvement; height of m/c from ground etc.

In Mechanical design the components are categorized in two parts.

- Design parts
- Parts to be purchased.

For design parts detail design is done and dimensions thus obtained are compared to next highest dimension which are readily available in market this simplifies the assembly as well as post production servicing work.

The various tolerances on work pieces are specified in the manufacturing drawings. The process charts are prepared & passed on to the manufacturing stage .The parts are to be purchased directly are specified &selected from standard catalogues.

System Design:-

In system design we mainly concentrate on the following parameter

A. System selection based on physical constraints:-

While selecting any m/c it must be checked whether it is going to be used in large scale or small scale industry In our case it is to be used in small scale industry So space is a major constrain .The system is to be very compact.

The mechanical design has direct norms with the system design hence the foremost job is to control the physical parameters.

B. Arrangement of various components:-

Keeping into view the space restriction the components should be laid such that their easy removal or servicing is possible moreover every component should be easily seen & none should be hidden every possible space is utilized in component arrangement.

C. Components of system:-

As already stated system should be compact enough so that it can be accommodated at a corner of a room. All the moving parts should be well closed & compact A compact system gives a better look & structure.

Following are some example of this section

- Design of machine height
- Energy expenditure in hand operation
- Lighting condition of m/c

D. Chances of failure:-

The losses incurred by owner in case of failure of a component are important criteria of design. Factor of safety while doing the mechanical design is kept high so that there are less chances of failure. Periodic maintenance is required to keep the m/c trouble free.

E. Servicing facility:-

The layout of components should be such that easy servicing is possible especially those components which required frequent servicing can be easily dismantled.

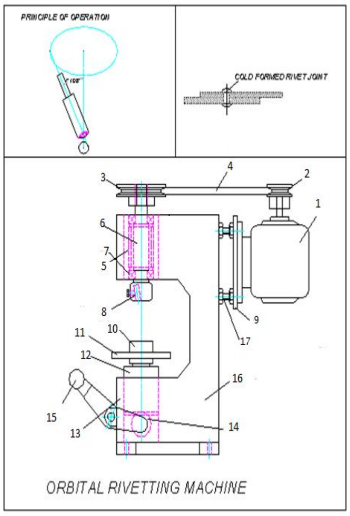
F. Height of m/c from ground:-

Fore ease and comfort of operator the height of m/c should be properly decided so that he may not get tired during operation .The m/c should be slightly higher than that the level also enough clearance be provided from ground for cleaning purpose.

G. Weight of machine:-

The total wt of m/c depends upon the selection of material components as well as dimension of components. A higher weighted m/c is difficult for transportation & in case of major break down it becomes difficult to repair.

Input to the automatic gear box is to be given similar to engine drive hence the approach is to utilize an variable speed AC motor with the facility to vary input power and there by the input speed by use of an electronic variator.



The orbital riveting machine consists of the following parts:

1	3-Phase Induction motor , 0.25 Hp , 1440 rpm	12	Table slide
2	Motor Pulley (2")	13	Table guide
3	Spindle Pulley (4")	14	Roller
4	Belt	15	Feed handle
5	Spindle Housing	16	C-Frame
6	Spindle	17	Belt Tension adjuster
7	Ball Barings		
8	Tool Holder		
9	Motor Plate		
10	Work Holder		
11	Work Table		

III. WORKING

Motor is started which rotates the main spindle at high speed. The tool or rivet set mounted in the tool holder rotates at high speed. The job to be riveted along with the rivet is placed in the work holder. The feed handle is pressed in the downward direction to lift the table slide and table in the table guide by means of roller arrangement. The tool spins about the rivet projecting out of the joint thereby cold forming the head on the rivet side. The amount of pressure applied depends upon the type of joint ie, fixed or hinged to be done. After riveting is done, the feed handle is released which brings the table slide down by self weight. Job is replaced in holder to form the next riveting joint.

IV. ADVANTAGES

- The rivet head is gradually formed into desired shape, hence excellent mechanical holding or security of joint.
- Resultant joint by orbital riveting machine is more resistant to vibrations.
- Orbital riveting machine gives quieter riveting.
- Orbital riveting machine causes limited deformation and pressure on parts to be assembled.
- Orbital riveting reduces cost of riveting.
- Fast riveting process.
- Many types of materials can be riveted.
- Can make both fixed as well as hinged joints.
- Low force to material upset ratio

V. APPLICATIONS

Orbital riveting machines are used in a wide range of applications including:

- brake linings for commercial vehicles,
- aircraft, and locomotives,
- textile and leather goods,
- metal brackets,
- window and doorfurniture,
- Latches and even mobile phones.
- Many materials can be riveted together using orbital rivetingmachines including delicate and brittle materials, and sensitive electrical or electroniccomponents
- Leather work, tools, toys, kitchen utensils, general hardware.
- Scissors, pliers, hinges, etc.
- Parts subjected to thermal cycling, e.g., Boiler shells.

VI. CONCLUSION

While concluding this part, we fill quite contended in having completed the project assignment well on time. We had enormous practical experience on the manufacturing schedules of the working project model. We are therefore, happy to state that the inculcation of mechanical aptitude proved to be a very useful purpose. We are as such overwhelmingly elated in the arriving at the targeted mission.Undoubtedly the joint venture has had all the merits of interest and zeal shown by all of us the credit goes to the healthy co-ordination of our batch colleague in bringing out a resourceful fulfillment of our assignment described by the university.Although the design criterion imposed challenging problems which however were welcome by us due to availability of good reference books. The selection of choice of raw materials helped us in machining of the various components to very close tolerances and thereby minimizing the level of wear and tear.In this report, we developed a branch and bound approach which is coupled with quick. The design of control architecture was an important aspect of study because a strong interaction between the many different parts was needed. So we are satisfied with our project.

REFERENCES

[1] Design of Machine Elements by Prof. V.B.Bhandari.

[2] P.S.G. Design Data Book.

[3] Theory of Machines by Thomas Beven.

[4] Theory of Machines by J.E.Shigley.

[5] Theory of Machines by P.L.Ballaney.

[6] Machine design - Khurmi Gupta

[7] Prof. Tushar A. Patil, & P. N. Ulhe, Analysis and Design of Drilling Cum Riveting Machine. January 2016, Volume 02. Ref: - PSG Design Data. Pg. No: - 1.10 & 1.12. 1.17

[8] Prof. K...G.Sontakke& Prof R. D. Vaidya ,A Review Paper On Design Of Drilling Cum Riveting Machine, November 2014, Volume 01, Issue 06.

[9] Prof. Manish Kale & Prof D. A. Mahajan, A Review on Development of Special Purpose Machine .April 2015, Volume 05, Issue 04.

[10] Prof. P.R. Savant, Mr. R. A.Barawade January-March, 2012, “Design and development of SPM - A case study in multi drilling and tapping machine,” IJAERS, Vol. I, E-ISSN2249–8974.